

Photographs of Neptune and its Satellite. By Isaac Roberts, F.R.S.

Sixteen photographs of the planet *Neptune* were taken at my observatory between December 9, 1890, and February 24, 1891, with exposures of the plates varying between fifteen minutes and three hours respectively. Upon eight of the plates the satellite is to be seen, and I have prepared the accompanying diagram to show its positions by measurements of the eight plates. The diameter of the photographic image of *Neptune* in my telescope is about equal to the major axis of the projected orbit of the satellite. The satellite can, therefore, be photographed only when it is somewhere within the distance of about 45° of the line of apsides, and if the planet did not mask the satellite in the other parts of its orbit the orbital motion would be too rapid to permit a photographic image being formed.

The large circle, fig. 1, represents the photographic image of *Neptune*, and the eight small circles around it those of the satellite. It is difficult to measure with accuracy the position angles of the satellite, because its image is generally very faint and undefined in outline by reason of the orbital motion; and the relatively large image of the planet adds to the difficulty in finding the line joining their centres. The position angles given in the following table are the nearest approximations practicable under these conditions.

Approximate position angles of the satellite :—

No. 1, 1890, December 9, exposure 3 hours; sidereal time, 5h. 25m....	$59^\circ 28'$
No. 2, 1890, December 12, exposure 15 minutes; sidereal time, 4h. 59m.	$232^\circ 40'$
No. 3, 1891, January 10, exposure 60 minutes; sidereal time, 4h. 14m.	$261^\circ 46'$
No. 4, 1891, February 1, exposure 84 minutes; sidereal time, 5h. 31m.	$31^\circ 29'$
No. 5, 1891, February 4, exposure 50 minutes; sidereal time, 5h. 4m.	$207^\circ 6'$
No. 6, 1891, February 10, exposure 75 minutes; sidereal time, 6h. 5m.	$193^\circ 55'$
No. 7, 1891, February 20, exposure 90 minutes; sidereal time, 6h. 54m.	$277^\circ 3'$
No. 8, 1891, February 24, exposure 75 minutes; sidereal time, 6h. 45m.	$44^\circ 53'$

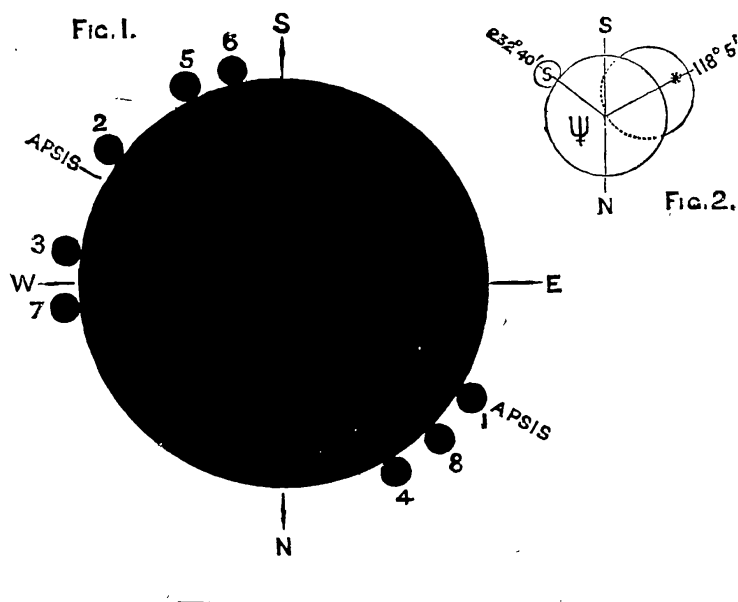
The sidereal time given in the above table is that at the middle of each exposure for the meridian of Crowborough, 37° East of Greenwich.

On December 12, 1890, *Neptune* was in conjunction with the star D.M., $+19^\circ$, 699, R.A. $4^h 11^m 17^s.5$, dec. $+19^\circ 24'.6$, mag. 9.4, and the relative positions of the star, planet, and satellite are shown on the diagram, fig. 2. At sidereal time $4^h 59^m$ the position angle of the planet and star was $118^\circ 5'$, and that of the satellite $232^\circ 40'$. The distance of the planet and star, measured from centre to centre, was $10''.85$ of arc. The

measured photo-diameter of the planet was $12''.21$, and of the star $9''.5$.

In the event of any computations being made touching the subject of this communication, the sixteen negatives referred to will be available for measuring positions and distances between the planet and the surrounding stars during the opposition of *Neptune* in 1891.

The photographs do not indicate the existence of any other satellite than the one discovered by Lassell.



Photograph of the Region of Hind's Variable Nebula in Taurus.
By Isaac Roberts, F.R.S.

In November last year Mr. Burnham, of the Lick Observatory, drew my attention to the region of Hind's Variable Nebula in Taurus, and informed me that he had searched the region with the 36-in. refractor and found what appeared to be a small star placed within a very small condensed nebula, the nebula being elongated in the direction of $151^{\circ}.7$. A rough reading of the wires gave $4''.4$ for the length of the nebula.*

The photograph does not show any nebulosity or nebula or nebulous star anywhere about the region here referred to, though the exposure extended during three hours, and therefore nebulosity of a much fainter character than that shown in the *Pleiades* should have appeared on the photograph.

I am not suggesting that there can be any error in the observations made at the Lick Observatory, but the absence of any trace of nebulosity on the photograph may point to some rapid

* *Monthly Notices, R.A.S.*, vol. li. p. 94.